# MERCURY CONTROL WITH THE ADVANCED HYBRID PARTICULATE COLLECTOR (Cooperative Agreement DE-FC26-01NT41184)

## STATEMENT OF WORK

## PROJECT DESCRIPTION

### Objective

The overall objective of the project by the Energy & Environmental Research Center (EERC) is to demonstrate 90% total mercury control with commercially available sorbents in the advanced hybrid particulate collector (AHPC) at a lower cost than current mercury control estimates.

### Test Goals

- Determine if the bench-scale mercury breakthrough results can be duplicated when real flue gas is sampled.
- Compare the level of mercury control with sorbents under similar conditions at the 200-acfm pilot scale between the AHPC and a pulse-jet baghouse.
- Demonstrate 90% mercury capture for both a western subbituminous and an eastern bituminous coal.
- Demonstrate mercury capture with the 9000-acfm AHPC at Big Stone.
- Demonstrate 90% mercury capture over a longer time (3 months) with the 9000-acfm AHPC at Big Stone.
- Evaluate the mercury capture effectiveness of the AHPC when used with elemental mercury oxidation additives and a spray dryer absorber.
- Evaluate the mercury capture effectiveness of the AHPC and baghouses when used with novel baghouse sorbent inserts downstream of the fabric filter.

### Scope of Work

Four types of testing will be performed:

1. Bench-scale tests with the existing EERC mercury sorbent testing system. This same system will also be used to sample real flue gas from the EERC 200-acfm pulverized coal-fired unit known as the particulate test combustor (PTC). A total of thirty 4-hr tests with the bench-scale unit are planned.

2. Pilot-scale tests with the PTC, which can be used with either a pulse-jet baghouse or the 200-acfm AHPC. This combustion system has been a workhorse for the EERC for many years and is the same system used for the earlier sorbent injection work as well as the Ontario Hydro method validation work. The PTC has consistently been shown to produce the expected mercury concentrations in the flue gas based on coal analysis and

typically produces an $Hg^{2+}/Hg^0$ split similar to that from full-scale power plants. Extensive mercury analysis will be conducted with both the Ontario Hydro method and mercury continuous emission monitors (CEMs). A total of 6 weeks of testing with the PTC is planned.

3. Demonstration tests at the Big Stone Power Plant with a pilot-scale 9000-acfm AHPC. The Big Stone Power Plant has graciously agreed to continue hosting the AHPC beyond the current testing to include mercury demonstration with the AHPC. A total of 4 months of additional testing are planned.

4. Demonstration tests at a North Dakota power plant to demonstrate the effectiveness of oxidation additives and alternative sorbents in spray dryer baghouse applications.

## TECHNICAL APPROACH/WORK PLAN DEFINITION

### Statement of Work Including the Project Description and Test Logic

To meet the objectives, the team proposes to use a six-task approach:

- Task 1: Project Management, Reporting, and Technology Transfer
- Task 2: Bench-Scale Batch Testing
- Task 3: Pilot-Scale Testing
- Task 4: Field Demonstration Pilot Testing at Big Stone Power Plant
- Task 5: AHPC Removal and Disposition from Big Stone Facility
- Task 6: Pilot and Field Testing in Spray Dryer and Baghouse Applications

Descriptions of each of these tasks are provided below.

### Task 1: Project Management, Reporting, and Technology Transfer

Task 1 will include all of the project management requirements of the project, including planning, coordination among team members, supervision of tests, review of results, attending meetings, and all aspects of reporting.

In addition to the U.S. Department of Energy (DOE) quarterly reports and the final project report, results of the work will be submitted for presentation at a minimum of three different conferences. It is anticipated that at least one of these will be DOE-sponsored, such as the previous contractor conferences sponsored entirely by DOE or conferences jointly sponsored by DOE with other organizations such as EPRI and the U.S. Environmental Protection Agency (EPA). Other likely conferences for presenting results of the research are the A&WMA (Air & Waste Management Association) annual meeting and a national or international conference on mercury. Because of the very long lag times between the performance of field tests, the acquisition of laboratory sample results (especially for solid coal and ash samples), and the complexity of data synthesis and interpretation, it is anticipated that the final report will not be available until approximately 1 year after the performance of the final field test.

One of the key requirements for transfer of research results to industry is the participation of one or more industrial partners. The project team includes W.L. Gore, which holds the exclusive license to the AHPC technology. This will ensure that the most recent data are available immediately to the company responsible for commercializing the AHPC. Demonstrating low-cost mercury control with the AHPC is of interest to Gore because it would likely increase the market potential of this technology even beyond the current level. Another key requirement for technology transfer is interest from an end user. The project team also includes the Big Stone Power Plant operated by Otter Tail Power Company. The presence of a utility power company on the project will ensure that results are immediately available to assist the utility in planning for regulation of mercury, should that be required.

### Task 2: Bench-Scale Batch Testing

The bench-scale tests are for the purpose of verifying previous results, expanding on the $SO_2$ and $NO_2$ concentrations effect, and linking the synthetic gas results to the results with real flue gas. There are more individual bench-scale tests than pilot-scale tests, but the bench-scale tests are of short duration and represent only about 5% of the total project.

These tests will be completed with the existing EERC bench-scale mercury sorbent testing system that has previously been developed under other projects. This system has been extensively used to screen sorbents and develop an understanding of the effects of flue gas concentrations on mercury capture. Results using mercury CEMs at the outlet have proven to be highly repeatable and produce excellent mass balance closures when compared with independent mercury analysis of the spent sorbent. The 30 tests planned with the bench-scale unit are divided into three series that follow a logical progression. The first series of tests are being done for two reasons: first, to ensure that results obtained by the EERC and others can be duplicated and; second, to include $SO_2$ and $NO_2$ as variables. Series 1 tests, shown in Table 1, are intended to verify the previous bench-scale work and expand on the $SO_2$ and $NO_2$ concentration effect. In previous work, no tests were completed in which both the $SO_2$ and $NO_2$ were reduced at the same time. These results are expected to show whether the $SO_2$ and $NO_2$ concentration effects are additive and, once verified with real flue gas, will serve as a basis to predict the sorbent capacity if the $SO_2$ and $NO_2$ concentrations are known.

In all of these tests, an inlet $Hg^0$ concentration of 15 $\mu g/m^3$ will be used. Tests with an oxidized form of mercury are not planned because of the uncertainty over what actual form of mercury exists in real flue gas for various coals. In addition, previous EERC bench-scale tests showed that the LAC (lignite-based activated carbon) sorbent collects $HgCl_2$ better than $Hg^0$ over the temperature range from 225° to 325°F. Between these two species, $Hg^0$ represents the most difficult capture case. Further, the sampling tests with real flue gas are intended to identify whether there are significant differences between the synthetic flue gas tests with $Hg^0$ alone and real flue gas where both $Hg^0$ and $Hg^{2+}$ are present. Each test will be for a duration of approximately 4 hr. The 150 mg of sorbent is equivalent to a sorbent-to-mercury ratio of 3700

**Table 1. Bench-Scale Series 1 – $SO_2$ and $NO_2$ Concentration**

| Test No. | Sorbent Type | Temp., °F | Sorbent Concentration, mg | Flue Gas | $SO_2$, ppm | HCl, ppm | NO, ppm | $NO_2$, ppm |
|---|---|---|---|---|---|---|---|---|
| 1 | LAC | 275 | 150 | Simulated | 1600 | 50 | 400 | 20 |
| 2 | LAC | 275 | 150 | Simulated | 500 | 50 | 400 | 20 |
| 3 | LAC | 275 | 150 | Simulated | 200 | 50 | 400 | 20 |
| 4 | LAC | 275 | 150 | Simulated | 1600 | 50 | 400 | 10 |
| 5 | LAC | 275 | 150 | Simulated | 500 | 50 | 400 | 10 |
| 6 | LAC | 275 | 150 | Simulated | 200 | 50 | 400 | 10 |
| 7 | LAC | 275 | 150 | Simulated | 1600 | 50 | 400 | 5 |
| 8 | LAC | 275 | 150 | Simulated | 500 | 50 | 400 | 5 |
| 9 | LAC | 275 | 150 | Simulated | 200 | 50 | 400 | 5 |
| 10 | LAC | 275 | 150 | Simulated | Repeat Test to Be Selected | | | |

after 3 hr of exposure. This concentration has been shown to provide consistent results in previous testing and is sufficient to accurately measure the amount of mercury in the spent sorbent for mass balance closure, which will be verified for approximately one-third of the tests.

The second series of bench-scale tests (Table 2) is for the purpose of comparing the bench-scale fixed-bed results sampling real flue gas to those obtained with simulated flue gas. These comparisons will be made for both a western subbituminous and an eastern bituminous coal. The simulated flue gas concentrations will be matched to actual concentrations measured in the combustion tests. Since these results are critical, both the real flue gas and simulated flue gas tests will be duplicated for quality assurance. In addition, tests with lower sorbent concentrations will also be conducted with flue gases matched to the two coals to assist in selecting the best sorbent concentrations for the pilot-scale tests. The real flue gas tests will be completed as part of the first two pilot-scale tests in Task 3. These bench-scale tests will be conducted using a slipstream bench-scale system sampling flue gas during the proposed pilot-scale tests. These critically important experiments have never been done.

The third series of bench-scale tests (Table 3) is for the purpose of screening alternative sorbents. The IAC (iodine-impregnated activated carbon) sorbent was chosen because of the excellent results seen in some of the previous EERC pilot-scale tests, especially at higher temperatures from 250° to 350°F. The IAC also appears to be better at capturing $Hg^0$ than the LAC. However, since the IAC is more costly than LAC, it must be effective at lower concentrations than the LAC. The IAC will be evaluated with flue gas concentrations for both a subbituminous and a bituminous coal at two concentration levels and at two temperatures. Four additional screening tests will be conducted on other promising alternative sorbents to be selected based on new information and availability. The results from these tests will be used to prescreen alternative sorbents that have the potential to provide better mercury capture than the

**Table 2. Bench-Scale Series 2 – Real Flue Gas Comparison**

| Test No. | Sorbent Type | Temp., °F | Sorbent Concentration, mg | Flue Gas | $SO_2$, ppm | HCl, ppm | NO, ppm | $NO_2$, ppm |
|---|---|---|---|---|---|---|---|---|
| 11 | LAC | 275 | 50 | Real | Flue gas from western coal | | | |
| 12 | LAC | 275 | 150 | Real | Duplicate test western coal | | | |
| 13 | LAC | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 14 | LAC | 275 | 150 | Simulated Duplicate* | 400 | 4 | 300 | 5 |
| 15 | LAC | 275 | 50 | Simulated* | 400 | 4 | 300 | 5 |
| 16 | LAC | 275 | 150 | Real | Flue gas from eastern coal | | | |
| 17 | LAC | 275 | 150 | Real | Duplicate test eastern coal | | | |
| 18 | LAC | 275 | 150 | Simulated* | 1000 | 50 | 400 | 10 |
| 19 | LAC | 275 | 150 | Simulated Duplicate* | 1000 | 50 | 400 | 10 |
| 20 | LAC | 275 | 50 | Simulated* | 1000 | 50 | 400 | 10 |

* Simulated flue gases will be determined from actual flue gas measurements during combustion tests; values shown are estimates.

**Table 3. Bench-Scale Series 3 – Sorbent Type**

| Test No. | Sorbent Type | Temp., °F | Sorbent Concentration, mg | Flue Gas | $SO_2$, ppm | HCl, ppm | NO, ppm | $NO_2$, ppm |
|---|---|---|---|---|---|---|---|---|
| 21 | IAC | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 22 | IAC | 275 | 50 | Simulated* | 400 | 4 | 300 | 5 |
| 23 | IAC | 275 | 150 | Simulated* | 1000 | 50 | 400 | 10 |
| 24 | IAC | 275 | 50 | Simulated* | 1000 | 50 | 400 | 10 |
| 25 | IAC | 325 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 26 | IAC | 325 | 150 | Simulated* | 1000 | 50 | 400 | 10 |
| 27 | New No. 1** | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 28 | New No. 2** | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 29 | New No. 3** | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |
| 30 | New No. 4** | 275 | 150 | Simulated* | 400 | 4 | 300 | 5 |

* Simulated flue gases will be determined from actual flue gas measurements during combustion tests; values shown are estimates.
** New sorbents will be selected based on background data and availability.

LAC. The most promising sorbent would then be further evaluated in pilot-scale testing in Task 3.

**Task 3: Pilot-Scale Testing**

Eight weeks of testing are planned under Task 3 (Table 4).

**Table 4. Task 3 – Pilot-Scale Testing**

| Week/ | | | Collection | Sorbent | C:Hg | Injection |
|---|---|---|---|---|---|---|

| Test | Purpose | Coal | Device | Type | Ratio | Method |
|---|---|---|---|---|---|---|
| 1-1 | Baseline | WSB[1] | PJBH[2] | None | NA[3] | NA |
| 1-2 | Baseline | WSB | AHPC | None | NA | NA |
| 2-1 | Baseline | EB[4] | PJBH | None | NA | NA |
| 2-2 | Baseline | EB | AHPC | None | NA | NA |
| 3-1 | Hg capture, collection device | WSB | PJBH | LAC | 3000[5] | Type 1 |
| 3-2 | Hg capture, collection device | WSB | AHPC | LAC | 3000[5] | Type 1 |
| 4-1 | Hg capture | WSB | AHPC | LAC | 3000[5] | Type 1 |
| 4-2 | Hg capture | WSB | AHPC | LAC | 3000[5] | Type 2 |
| 5-1 | Hg capture | EB | AHPC | LAC | 3000[5] | Type 1 |
| 5-2 | Hg capture | EB | AHPC | LAC | 3000[5] | Type 2 |
| 6-1 | Sorbent type and concentration | WSB | AHPC | New 1[6] | 3000[5] | Type 1[6] |
| 6-2 | Sorbent type and concentration | WSB | AHPC | New 1[6] | 1000[5] | Type 1[6] |
| 6-3 | Sorbent type and concentration | WSB | AHPC | New 2[6] | 3000[5] | Type 1[6] |
| 6-4 | Sorbent type and concentration | WSB | AHPC | New 2[6] | 1000[5] | Type 1[6] |
| 7 & 8 | Sorbent type and concentration | WSB | AHPC | Gore[7] | NA | NA |

[1] Western subbituminous.
[2] Pulse-jet baghouse.
[3] Not applicable.
[4] Eastern bituminous.
[5] Estimated concentrations, actual concentration will be based on previous testing.
[6] To be selected.
[7] Bag insert within the AHPC.

A week of testing includes an 8-hr heatup period on gas and then approximately 100 hr of steady-state operation firing coal. This allows for four 24-hr test periods where the PTC is operated around the clock. The first 2 weeks will be for the purpose of generating baseline data without carbon injection for a bituminous and a subbituminous coal with both the PJBH and the AHPC. Each test will be for a duration of approximately 48 hr. These tests will establish the amount of mercury capture by fly ash and will determine whether the amount of mercury capture is different between the PJBH and the AHPC. It will also establish the inlet and outlet speciated mercury concentrations and whether there is a change in mercury speciation across both devices. The second purpose for these baseline tests is to provide flue gas to support the bench-scale testing with real flue gas under Task 2.

Weeks 3 and 4 are designed to prove the ability of the technology to control mercury at the 90% level with a Powder River Basin (PRB) coal. Week 5 is for the purpose of testing mercury control in the AHPC with an eastern bituminous coal.

Week 6 is for the purpose of testing alternative sorbents in the AHPC. The need for alternative sorbent testing will be somewhat dependent on the results with the LAC sorbent. If 90% mercury capture were already demonstrated with both coals at a low sorbent concentration (for example, less than 3000:1), then there may be no need to further evaluate other sorbents. In this case, Week 6 will be cancelled, and testing with the field AHPC will proceed. However, if results with the LAC sorbent have not met expectations and other sorbents look more promising or if other unanswered questions remain that could be tested in the pilot tests, Week 6 will be completed.

Weeks 7 and 8 will test an innovative new sorbent technology developed by W.L. Gore & Associates, Inc., one of the project's sponsors and primary partners. The development of mercury adsorbents with capacities far greater than conventional activated carbon is the basis of this work. These high-capacity adsorbents have allowed Gore to move the mercury-controlling function from a consumable, as with activated carbon, to a fixed system component. Specifically, the configuration to be tested involves a mercury control filter placed inside the existing particulate control filter bag, essentially a bag-within-a-bag concept. Prior testing, funded by Gore, at the EPA research facility in Research Triangle Park, North Carolina, has shown significant levels of both elemental and ionic mercury capture. This approach is highly compatible with the AHPC and offers many advantages as an alternative to the use of disposable activated carbon. The plan is to conduct a 2-week test with the pilot-scale AHPC to evaluate the mercury capture performance of the Gore technology. These tests will be conducted with a subbituminous coal at an AHPC temperature of 149°C (300°F).

For all of the pilot-scale tests, extensive mercury sampling with both the Ontario Hydro method and mercury CEMs will be completed. The Ontario Hydro measurements will also provide a measure of the particulate collection efficiency of the AHPC. During each week, a total of two to three inlet and six to eight outlet Ontario Hydro samples will be completed. In addition, continuous outlet measurements will be completed with at least one mercury CEM (Semtech, Tekran, or PS Analytical). Several shorter tests will also be completed at the inlet with the mercury CEMs. All other flue gases, such as $O_2$, CO, $CO_2$, $SO_2$, NO, and $NO_2$, will be monitored by CEMs on the PTC. Chloride concentration in the flue gas will be determined by Method 26A. The feed coals and fly ash samples (which will include the spent sorbent) will also be analyzed for mercury for each test. Approximately three ash samples will be submitted for leaching analysis for each coal type. These samples will also be made available for an air desorption test method that is being developed under EPA funding at the EERC. The specific subbituminous and bituminous coals to be tested will be selected at a later date. A logical choice for the subbituminous coal would be the coal burned at the Big Stone Power Plant; however, since several different subbituminous PRB coals were used at this plant during the last year, the exact coal that would be used during the field testing is uncertain. A logical selection for the bituminous coal would be Blacksville since significant mercury test data for this coal already exist (both at the EERC and elsewhere); however, new information may point to a different coal as a better selection.

### Task 4: Field Demonstration Pilot Testing at Big Stone Power Plant

Big Stone Power Plant was commissioned for service in 1975. The unit is jointly owned by three partners: NorthWestern, Montana–Dakota Utilities, and Otter Tail Power Company. The unit is a 450-MW-rated, Babcock and Wilcox cyclone-fired boiler. The primary fuel for the first 20 years of operation was North Dakota lignite, but 4 years ago, the primary fuel was switched to PRB subbituminous coal. This fuel has approximately one-half of the moisture and one-third more heat than North Dakota lignite. Almost all of the effects of this new fuel have been positive. However, one challenge that has occurred is the decreased efficiency of the electrostatic precipitator (ESP) because of an increase in resistivity of the fly ash. The combinations of a very fine particle size produced from the cyclone-fired boiler and high ash resistivity make this a challenging test for the AHPC.

Demonstration of mercury control with the AHPC at the 9000-acfm scale at a utility power plant is the next logical step toward proving the commercial validity of this approach. Since the field AHPC will still be on location at the Big Stone Power Plant and we will have just completed the current Phase III demonstration testing, the system will be ready for mercury testing. The only modification required is the addition of a sorbent injection system.

A total of 10 weeks of field tests at the Big Stone Power Plant are planned. Baseline testing will be conducted without sorbent injection to establish the mercury concentration, speciation, and amount of fly ash capture. A comparison will also be made of the mercury emissions at the plant stack with the AHPC outlet to determine if the amount of fly ash capture of mercury and possible change in mercury speciation across the plant ESP and AHPC are different.

The primary objective of the field tests at Big Stone will be to establish the sorbent addition rate needed to achieve 90% mercury control. The field data will be reviewed to determine if an acceptable level of mercury control has been achieved, and the results will be compared with the 200-acfm pilot-scale tests. If results are acceptable, field testing will continue. Depending on the level of success with the LAC sorbent in the field and the pilot-scale test results with alternative sorbents, alternative sorbents will also be evaluated at Big Stone. The field testing will also establish whether there are any longer-term problems associated with sorbent injection, such as bag-cleaning problems.

Intensive mercury sampling is planned for the entire 10-week field testing program at Big Stone. For the baseline testing, a total of 12 Ontario Hydro samples will include the inlet and outlet of the AHPC, the plant inlet to the ESP, and the plant stack. NO and $NO_2$ will be measured with a portable CEM; $SO_2$ and $NO_x$ will be obtained from the plant CEMs; and HCl will be determined with Method 26A. A mercury CEM will also be installed at the AHPC outlet for continuous measurements during the day. Coal and fly ash samples from both the plant ESP and AHPC will be analyzed for mercury. During sorbent injection, approximately three inlet and eight outlet samples will be completed as well as mercury CEM measurements taken during the day.

### Task 5: AHPC Removal and Disposition from Big Stone Facility

Since the bench-scale and pilot-scale systems already exist at the EERC and are likely to be used for continuing research on other projects, it is expected that they will remain in place at the EERC after the completion of this proposed work and no facility removal will be required. The field AHPC will be dismantled and removed at the end of this project if no further testing is anticipated in support of subsequent work at the Big Stone Power Plant. If further testing were to be completed with the field AHPC at another site (funded by possible subsequent projects), the AHPC components would be moved to that site. If no other AHPC testing is anticipated, the salvageable AHPC components will be returned to the EERC, and the larger steel components will be disposed of as scrap steel. The site will then be restored to its original condition. The Big Stone Power Plant will be responsible for removing the 24-in. ductwork that breeches the plant ductwork, the electrical power lines, air supply lines, and communication lines once the project is complete.

**Task 6: Pilot and Field Testing in Spray Dryer Baghouse Applications**

The AHPC testing in Tasks 3 and 4 involve injection of sorbents upstream of the AHPC to demonstrate 90% total mercury control in situations that do not require injection of additional sorbents to remove $SO_2$ or other acid gases. Task 6 will test the application of the AHPC to capture mercury in flue gases that contain high levels of elemental mercury emissions and low levels of acid gases typical of spray dryer absorber (SDA) and baghouse applications at North Dakota lignite-fired systems. Work under Task 6 includes 1) pilot-scale (200-acfm) tests of the injection of Hg oxidation additives upstream of a lime-based spray dryer–AHPC combination and 2) field-testing of the W.L. Gore mercury adsorbent technology at a North Dakota power plant using a slipstream baghouse.

***Subtask 6.1 – Pilot-Scale Testing of Mercury Oxidation Additives in Spray Dryer Scrubber Combined with AHPC or Baghouse***

A pilot-scale SDA will be ordered from an appropriate vendor. The pilot system must simulate SDAs used in selected North Dakota power plants. Potential $Hg^0$ oxidation additives will be evaluated using the PTC equipped with the refurbished SDA and AHPC. Pilot-scale testing will involve a North Dakota lignite coal with short-term (1–2 hr) screening tests of several oxidation additives including chloride compounds (e.g., sodium chloride, hydrogen chloride, calcium chloride) and potassium iodide, followed by long-term (8–10 hr) evaluations of two or more of the most promising additives. In most cases, the additives will be blended with the coals. Gaseous hydrogen chloride will be injected into the PTC.

$Hg^0$ and total Hg levels will be measured on a nearly continuous basis using a CEM at the inlet and outlet locations of the SDA. Slaked lime slurry feed and the SDA product solids will be analyzed for Hg content. Additive blend ratios and injection rates will be varied to evaluate the effectiveness of additives to oxidize $Hg^0$. Economic analyses will be performed for the additives that are most effective.

***Subtask 6.2 – Field Testing of Sorbents and Gore Technology***

This task will test how effectively Hg can be captured by using a sorbent-based technology and the recently announced Gore technology in conjunction with a PJBH at a power plant in North Dakota. The Gore technology consists of a proprietary baghouse insert downstream of the fabric filter that has shown a high potential to control Hg. An existing baghouse will be skid-mounted and transported to a power plant in North Dakota and connected in slipstream fashion to allow for testing actual flue gases. Additions to the existing baghouse unit for remote field application will include a control room for remote operation, piping and flanges for connection to plant ductwork, a variable-speed fan, and a sorbent injection system for Hg control. The PJBH can be operated for much longer periods of time in the field than when operated with the pilot-scale AHPC.

The skid-mounted baghouse will be installed downstream of an existing particulate control device such as an ESP. The Gore technology will be installed, tested, and monitored for up to 4 months monitored for Hg capture effectiveness. For these measurements, EPA Method 101A will be used to determine the total Hg (only) removed across the baghouse system.

Results from the tests will be reduced, compiled, interpreted, and reported. Mercury removal efficiencies for both the sorbent-based and Gore technologies will be calculated, compared, and reported.

### Project Schedule and Milestones

The project schedule is provided in Table 5, with the milestone schedule in Table 6.

**Table 5. Project Schedule**

| **Project Schedule** | 2001 | | 2002 | | | | 2003 | | | | 2004 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3rd Qtr | 4th Qtr | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr |
| Bench-Scale Tests | | | | | | | | | | | | | | |
| Pilot-Scale Tests | | | | | | | | | | | | | | |
| Field Testing at Big Stone | | | | | | | | | | | | | | |
| Testing in Spray Dryer–Baghouse Applications | | | | | | | | | | | | | | |
| Project Management and Reporting | | | | | | | | | | | | | | |

**Table 6. Milestone Schedule**

| Milestone | Completion Date |
|---|---|
| **Bench-Scale Tests** | |
| Series 1 | September 30, 2001 |
| Series 2 | December 31, 2001 |
| Series 3 | July 31, 2002 |
| **Pilot-Scale Tests** | |
| Week 1 | January 31, 2002 |
| Week 2 | June 30, 2002 |
| Week 3 | April 30, 2002 |
| Week 4 | May 31, 2002 |
| Week 5 | December 31, 2002 |
| Week 6 | January 31, 2003 |
| Weeks 7 and 8 | March 31, 2004 |
| **Field Testing at Big Stone Plant** | |
| Baseline | February 28, 2002 |
| Initial Sorbent Testing | June 30, 2002 |
| Long-Term Demonstration | June 30, 2003 |
| Removal and Disposition | To be determined* |
| **Testing in SDA–Baghouse Applications** | |
| Testing of Elemental Hg Additives | December 31, 2003 |
| Field Demonstration of Gore Sorbent Technology | April 30, 2004 |
| **Project Management and Reporting** | |
| Quarterly Report 1 | September 30, 2001 |
| Quarterly Report 2 | December 31, 2001 |
| Quarterly Report 3 | March 31, 2002 |
| Quarterly Report 4 | June 30, 2002 |
| Quarterly Report 5 | September 30, 2002 |
| Quarterly Report 6 | December 31, 2002 |
| Quarterly Report 7 | March 21, 2003 |
| Quarterly Report 8 | June 30, 2003 |
| Quarterly Report 9 | September 30, 2003 |
| Quarterly Report 10 | December 31, 2003 |
| Quarterly Report 11 | March 31, 2004 |
| Quarterly Report 12 | June 30, 2004 |
| Quarterly Report 13 | September 30, 2004 |
| Final Report | December 31, 2004 |

* Date will depend on possible add-on work at the current test facility.